

**Remarks/Arguments:**

Claims 1-6, 8, 9, 11, and 14-16 are pending in the application.

**Rejections under 35 U.S.C. §103**

Claims 1, 2, and 8 stand rejected as unpatentable over U.S. Patent No. 2,592,523 ("Ayers") in view of U.S. Patent No. 4,011,882 ("Nivens"). Claims 3-6 stand rejected as unpatentable over Ayers and Nivens and further in view of U.S. Patent No. 6,059,962 ("Alexander"). Claims 9, 11, and 14-16 stand rejected as unpatentable over Ayers and Nivens and further in view of EP Patent No. 0 319 615 ("Duisters"). Applicants traverse these rejections and submit that the currently pending claims are patentable over these cited references for at least the reasons set forth below.

"To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. §2143. Additionally, as set forth by the Supreme Court in KSR Int'l Co. v. Teleflex, Inc., 82 U.S.P.Q.2d 1385 (2007), it is necessary to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed.

**Rejection of Claims 1, 2, and 8**

Claim 1 recites "a method of making a sulphided ion exchange resin containing primary or secondary amino groups and the concomitant removal of elemental sulphur from a liquid hydrocarbon feedstock comprising passing said feedstock containing **elemental sulphur** through a bed of an **ion exchange resin containing primary or secondary amino groups**, thereby forming a sulphided ion exchange resin containing primary or secondary amino groups." None of the references, alone or in any reasonable combination, teaches each of the claimed limitations.

First, Applicants reiterate from the previous response that Nivens fails to disclose or suggest the use of secondary aliphatic amines in a solution to remove *elemental sulphur* from a hydrocarbon fluid. The Office Action found Applicants previous arguments unpersuasive and maintains "Nivens et al additionally discloses the use of secondary aliphatic amines in a solution to remove elemental sulphur from a pipeline . . . ." Applicants respectfully traverse. Nivens teaches amines in a wash solution, in conjunction with other ingredients, are effective in removing *not elemental sulphur*, but rather the sulphur complexes and compounds produced by the reaction of the additive (corrosion inhibitor) with the sulphur and sulphur compounds in the sour hydrocarbon fluids. See Nivens col. 7, lines 26-44. Nivens teaches that amines are used to remove from the interior pipeline surfaces sulphur complexes, not simply "elemental sulphur" as claimed in claim 1.

Second, Applicants maintain a combination of Ayers and Nivens would not arrive at the invention as claimed in claim 1. Nivens uses a hydrocarbon liquid wash containing soluble amine compounds to remove sulphur that has become fixed by complex formation to the interior walls of a pipeline. Ayers is directed to a solid amine-modified resin, but does not teach the removal of elemental sulphur from a liquid hydrocarbon feedstock using an ion exchange resin. Even assuming *arguendo* Ayers discloses an ion exchange resin, which Applicants maintain is not the case, Nivens only teaches removing acidic hydrogen sulphide or mercaptans and not elemental sulphur as claimed. Further, Nivens recites "light" and "heavy" amines broadly and focuses on the solubilizing properties of the amines. See Nivens col. 4, line 56 to col. 5, line 26. A person of ordinary skill would not try to use an ion exchange resin to "insolublize" sulphur. Claim 1, in contrast to this teaching, recites "forming a sulphided ion exchange resin." Lastly, Nivens teaches high concentrations of amines that can cause the formation of gums, which would teach away from the notion of applying solids for sulphur removal. See Nivens col. 6, lines 41-46. Thus, combining Ayers and Nivens would not arrive at the features of the claimed invention, and it would not make sense to one skilled in the art to combine them.

Alternatively, Applicants respectfully contend that Nivens is not analogous to Applicants' invention. There are two bases for holding prior art analogous for an obviousness determination: 1) art from the same field of endeavor regardless of the problem addressed, or

2) art from different fields addressing the same problem. *State Contracting & Engineering Corp. v. Condotte America, Inc.*, 68 USPQ2d 1481 (Fed. Cir. 2003) (reversing district court's holding of non-obviousness and remanding because record presents a factual question as to whether the reference is analogous art); *Wang Laboratories, Inc. v. Toshiba Corp.*, 26 USPQ2d 1767 (Fed. Cir. 1993). In this case, the field of the present invention is a sulphided ion exchange resin, formed by passing a liquid hydrocarbon through an ion exchange resin. On the other hand, the field of Nivens is minimizing sulphur-complex contamination in a pipeline transporting hydrocarbons. These fields are quite different. Turning to the problems addressed, the present invention addresses the problems associated with preparing a sulphided ion exchange resin with primary or secondary amino groups. On the other hand, the problem addressed by Nivens is minimizing corrosion caused by sulphur compounds adhered to pipeline walls, by using a sweet hydrocarbon wash to solubilize the sulphur complexes. Thus, the problems addressed by the present invention and Nivens are far removed: In the present invention, conditions need to be selected to encourage elemental sulphur from a liquid hydrocarbon to become associated with the ion exchange resin; whereas in Nivens, conditions need to be selected to cause the solubilization of a sulphur complex adhered as a solid to a pipeline wall.

None of the references, alone or in any reasonable combination, teaches each of the claimed limitations. In particular, claim 1 recites passing a liquid hydrocarbon feedstock containing elemental sulphur through a bed of an ion exchange resin containing primary or secondary amino groups. Because a *prima face* case of obviousness has not been shown, it is respectfully submitted that independent claim 1 is in condition for allowance. Claims 2-6, 8, 9, 11, and 14-16 depend from claim 1 and therefore should each be allowed for at least the reasons set forth above.

Claim 2 further recites "the liquid hydrocarbon feedstock is passed through a **bed of a hydrogen sulphide absorbent after** passage through the bed of **the ion exchange resin.**" Ayers and Nivens do not teach passing a hydrocarbon feedstock through a bed of a hydrogen sulphide absorbent after passing through the ion exchange resin. Ayers teaches a single step of removing hydrogen sulfide with a modified resin. See Ayers col. 2, lines 26-43. There is no reference to a distinct and separate bed of hydrogen sulphide absorbent, e.g., no secondary

step is disclosed. Further, if the hydrogen sulfide was removed with the resin as described in Ayers, it would not make sense to have a second step of hydrogen sulphide absorbent. Nivens clearly does not disclose this feature.

None of the references, alone or in any reasonable combination, teaches each of the claimed limitations. The Office Action does not provide any citation with respect to claim 2, and it appears that the proper scope of claim 2 was not appreciated. Thus, Applicants respectfully submit a *prima facie* case of obviousness has not been established, and claim 2 should be in condition for allowance.

### **Rejection of Claims 3-6**

Claims 3-6 are patentable for at least the reasons discussed above. Further, claim 3 recites "a method according to claim 1 wherein water is removed from the ion exchange resin before use." The Office Action relies upon Alexander for teaching that "too much hydration of the catalyst or acidic resin catalyst can soften the catalyst, physically agglomerate and create high pressure drops in fixed bed reactor." Office Action pg. 5, lines 1-3.

The references alone or in combination do not teach the feature of removing water from the ion exchange resin before use. Alexander relates to acid-catalyzed alkylation of aromatic sulphur compounds to form higher boiling sulphur compounds, which may be separated by fractional distillation of hydrocarbons. See Alexander col. 4, lines 25-46. It does not relate to removing sulphur from hydrocarbon feedstocks nor amine-functional ion exchange resins. The passage quoted in the Office Action relates to a degree of hydration of solid phosphoric acid catalysts. Thus, the teaching of the present invention, that water can retard the absorption of elemental sulphur from hydrocarbon liquids when using an amine-functional resin, is not evident from Alexander or the other references. We also note Alexander states earlier "[i]f the catalyst contains too little water, it tends to have a very high acidity . . . [and] the catalyst will not possess a good physical integrity." See Alexander col. 13, lines 7-10. This is contrary to the teachings of the claimed invention. See comparison of Example 3 to Examples 1 and 2 of the present invention.

None of the references, alone or in any reasonable combination, teaches each of the claimed limitations. Applicants respectfully submit a *prima facie* case of obviousness has not been established, and for at least these reasons, and further due to the dependency on claim 1, claims 3-6 are in condition for allowance.

#### **Rejection of Claims 9, 11, and 14-16**

Claims 9, 11, and 14-16 are patentable for at least the reasons discussed above. Further, claim 9 recites "said liquid hydrocarbon feedstock further comprises mercury or inorganic mercury compounds, and wherein **at least the inlet portion of the bed of an exchange resin is sulphided before a mercury containing stream is passed through the bed, thereby to remove said mercury or organic mercury compounds** from said liquid hydrocarbon feedstock." The Office Action relies upon Duisters for teaching "mercury very often occurs in organic media, especially non-polar organic media like hydrocarbon mixtures during their process or storage." Office Action page 7, lines 8-10.

Neither the references alone nor in any reasonable combination teach the feature of at least the inlet portion of the bed of an exchange resin is sulphided before a mercury containing stream is passed through the bed. Duisters relates to removing mercury from hydrocarbon mixtures using a thiol-functional absorbent and may also contain sulphonic acid groups. The absorbent resin of Duisters does not comprise elemental sulphur and does not disclose a sulphided ion exchange resin. Because the limitations of claim 9 are not present in these references, a *prima facie* case of obviousness is not met, and claim 9 should be in condition for allowance. Claims 11 recites similar features of removing mercury using a sulphided ion exchange resin and should be in condition for allowance for at least the reasons set forth above. Claims 14-16 depend from claim 11 and are allowable as dependent thereon.

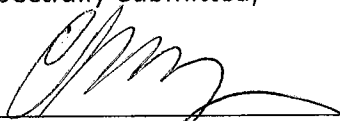
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**Conclusion**

For all of the foregoing reasons, Applicants respectfully request reconsideration and allowance of the claims. Applicants invite the examiner to contact their undersigned representative if it appears that this may expedite examination.

Respectfully submitted,



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